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Use of GPS 'J'racking Data from Low Earth Flight Receiver to Determine Geocenter Location

R. P. Malla, S. C. Wu and S. M. Lichten
Jet Propulsion 1 aboratory, California Institute of Technology

Geocentric tracking station coordinates can be measured with Global Positioning System (GPS). Initial GPS results for the estimated location of the Earth's center of mass (the geocenter) using 21 Rogue receiver sites from the GIG '91 global GPS campaign showed 10-15 cm agreement with satellite laser ranging (SLR). These solutions were affected to some extent by a significant deficit of coverage in the southern hemisphere and holes in the GPS constellation. The IGS '92 geocenter estimate averaged over several months of GPS data when compared with ITRF '91 shows a poorer estimation of ΔZ as compared to AX and AY. The daily scatter in ΔZ estimates was relatively large, on the order of 10 cm rms. Series of covariance anal yses have predicted that temporal variations of Earth orientation parameters and geocenter location improve significantly when the GPS precise pseudorange and carrier-phase data collected from a flight receiver on board a highly inclined low Earth-orbiting satellite and from the receivers from a ground network are combined.

In this paper we intend to present GPS-based solutions for geocenter location using data over three. continuous arcs, each spanning 12 to 30 days in 1993 from 13 sites of a global network and from Topex/Poseidon. Daily estimates of the geocenter along with GPS orbits, Earth orientation parameters, Topex/Poseidon orbits and station locations were obtained. The results show a dramatic improvement in the ΔZ offset solution consistency as compared to that without including Topex/Poseidon data. With the GPS Topex/Poseidon flight data included, all three geocenter components are accurate to the cm-level based on daily solutions--apparently as accurate as any other known solutions for the geocenter. The GPS data from the highly inclined, low altitude, and shorter period orbit of Topex/Poseidon has demonstrated to nicely make up for the coverage, deficiency associated with ground tracking alone.

Proposed Session:	A2: GPS for Surveying	*or*	B6: Earth Observation
Send reply to:	Rajendra P. Malla MIS 238-600 Jet Propulsion 1 aboratory 4800 Oak Grove Drive Pasadena, CA 91109	*or*	Dr. Sien-Chong Wu M/S 238-600 Jet Propulsion laboratory 4800 Oak Grove Drive Pasadena, CA 91109
Telephone:	(818) 354-3276		(818) 3S4-4937
Fax:	(818) 393-4965		(818) 393-4965